

REMARKS

The Examiner indicated that the substitute specification has not been entered. However, Applicants did not file a substitute specification. Rather, two paragraphs of the specification were amended in response to the Examiner's objection. The objection was not repeated, so Applicants believe the amendments to the specification were entered.

Claims 1-17 were rejected pursuant to 35 U.S.C. § 103(a) as unpatentable over Robinson, et al. (U.S. Patent No. 6,582,367) in view of Hossack, et al. (U.S. Patent No. 5,873,830). Claims 18-29 were rejected pursuant to 35 U.S.C. § 103(a) as unpatentable over Robinson, et al. in view of Hossack, et al., and further in view of Smith, et al. (U.S. Patent No. 6,241,675).

Applicants respectfully request reconsideration of the rejections of claims 1-29, including independent claims 1, 11, 18 and 27. *New remarks are provided below in italics.*

Independent claim 1 recites scanning a two-dimensional plane over a first lateral range and scanning a three-dimensional volume over a second lateral range less than the first lateral range. Robinson, et al. and Hossack, et al. do not disclose these limitations.

As noted by the Examiner (page 3 of the Office Action dated October 15, 2007), Robinson, et al. do not disclose different lateral ranges for the 2D and 3D scans.

In response, the Examiner agrees that Robinson, et al. do not explicitly disclose different lateral ranges but now alleges that the 2D and 3D scans have different lateral regions, citing to the 2D scan plane having a larger lateral range than the front portion of the 3D scan.

Robinson, et al. do not show different 2D and 3D lateral ranges. The 2D image 402 is a cross-section of the 3D volume 400 (see 402 also labeled in the volume of Fig. 11). The 2D image and the 3D volume have identical lateral ranges.

The 3D volume 400 is six sided as shown. A single face may be smaller than the image region 402. However, the lateral range of the volume, not a portion of the volume, is claimed. The face is only a sub-set of the volume. The lateral range of the volume and the 2D image are the same.

Hossack, et al. also do not disclose different lateral ranges for 2D and 3D or even different scan types. Hossack, et al. improve spatial characteristics within a region of an image (col. 2, lines 31-34; and col. 5, lines 40-53). A same 2D plane corresponding to the images is

divided into two portions shown together as an image of the 2D plane (col. 2, lines 35-44; and col. 5, lines 54-65). Hossack, et al. change parameters within a same 2D plane, not different lateral extent for scans of different types, namely 2D and 3D.

The Examiner notes that Robinson, et al. disclose 2D and 3D different scan types, and that Hossack, et al. is cited for utilizing different lateral ranges. However, Hossack, et al. do not disclose different lateral ranges for different scans. Hossack, et al. use a composite image having a region of interest and area outside the region of interest (col. 2, lines 45-65; and Figure 5). One area is scanned. This area is divided into different parts for different scan parameter settings (e.g. 2 MHz outside the ROI and 4 MHz in the ROI). Hossack, et al. scan one region, but use different settings for different parts. Hossack, et al. do not use scans with different lateral ranges.

Both Hossack, et al. and Robinson, et al. do not disclose different lateral extent in a 2D plane and a 3D volume. Extending the teaching of Hossack, et al. to different types of scan regions is hindsight. The 2D region is not a region of interest of the 3D scan, and the 3D volume is not a region of interest of the 2D scan. Furthermore, Hossack, et al. teach different parameters to vary, but does not ever include lateral extent as a parameter to be varied (col. 2, lines 45-52).

The Examiner alleges the volume scan must be limited in lateral extent as compound to the 3D scan due to time considerations. This is not true. Robinson, et al. teach 2D and 3D regions with the same lateral extent (Figures 11 and 12). Hossack, et al. note frame rate, persistence and interpolation or techniques to change temporal resolution (col. 2, line 66 – col. 3, line 26). A person of ordinary skill would have used these techniques, not different lateral extent.

Independent claim 11 recites similar limitations, so is allowable for the same reasons.

Dependent claims 2-10 and 12-17 depend from claims 1 and 11, so are allowable for the same reasons. Further limitations patentably distinguish from the cited references.

Claim 4 recites a perpendicular lateral range. Hossack, et al. do not disclose different ranges for different scan types (2D and 3D).

Claims 5 and 13 recite images with different lateral extent. As discussed above, a person of ordinary skill in the art would not have provided different lateral scans. The images also would not be different.

Claims 6 and 14 recite 2D B-mode and 3D Doppler. The cited portion of Robinson, et al. describes tissue and vasculature. Vasculature is a tissue structure. Since the 3D scan is used to survey, there is no Doppler 3D.

Claim 8 recites two scans with different values for a parameter in addition to lateral extent. Hossack, et al. show different parameter values for different portions of a same image, not different images and not different types of scans. A person of ordinary skill would have used the different values for different portions of the 2D images, but would not have used the different values for the different types of scans.

Claims 9, 10 and 16 are allowable for the same reasons as claim 8.

Independent claim 18 recites scanning a volume at a lower resolution and scanning as sub-volume at a higher resolution. The combination of teachings of Robinson et al., Hossack, et al., and Smith, et al. would not have provided these limitations.

Robinson, et al. and Hossack, et al. would not have been used together as discussed above for claim 1.

If Smith et al. were used with Robinson, et al. and Hossack, et al., the resolution of the sub-volume would not be different. Hossack, et al. teach spatial and temporal variation (col. 2, line 30 – col. 3, line s 26). Smith, et al. note temporal speed (col. 2, lines 1-3). A person of ordinary skill in the art would have used the parameter adjustments of Hossack, et al. for speed. Hossack, et al. use inter-frame interpolation, differences in persistence, and increasing relative frame rate (col. 2, lines 66 – col. 3, line 26). A person of ordinary skill in the art would not have used a different resolution since Smith, et al. note speed and Hossack, et al. increase speed without increasing resolution.

The Examiner alleges obviousness to distinguish fine detail from coarse detail. High resolution is needed to show fine detail. Regional separation of resolution only allows distinction of fine and coarse details in the high resolution region. The low resolution region does not show fine detail. Given the obviousness reason of the Examiner, the entire volume would be high resolution to better distinguish fine and coarse detail.

Similarly, a clearer view is provided by high resolution for the entire volume.

The Examiner points out that Smith, et al. teach targeting a sub-volume, and that it would have been obvious to use higher resolution in the sub-volume. However, Smith, et al. scan for velocity determination. Velocity imaging is low resolution. Velocity imaging does not show fine anatomical detail. A person of ordinary skill would not have increased resolution for a sub-volume since the velocity sub-volume of Smith, et al. would not benefit.

There is no teaching to use higher sub-volume resolution. The allegations of obviousness based on specific procedure use hindsight reasoning.

Independent claim 27 is allowable for the same reasons as claim 18.

Dependent claims 19-16, and 28-29 depend from claims 18 and 27, so are allowable for the same reasons. Further limitations patentably distinguish from the cited references.

Claims 20-22 are allowable for the same reasons as claim 1.

Claim 23 recites generating two 3D representations. None of the cited references show 3D representations for both the volume and sub-volume.

CONCLUSION

Applicants respectfully submit that all of the pending claims are in condition for allowance and seeks early allowance thereof.

PLEASE MAIL CORRESPONDENCE TO:

Siemens Corporation
Customer No. 28524
Attn: Elsa Keller, Legal Administrator
170 Wood Avenue South
Iselin, NJ 08830

Respectfully submitted,
/Rosa S. Kim/

Rosa S. Kim, Reg. No. 39,728
Attorney(s) for Applicant(s)
Telephone: 650-694-5330
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